Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(2), 2203-2211 | ISSN:2251-6727

A Prospective Observational Study on Cervical and Lumbar Spine Conditions: Effectiveness of Conservative Treatment Versus Surgical Interventions

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(Received: 16 January 2026 Revised: 25 February 2026 Accepted: 17 March 2026)

KEYWORDS
Spondylosis, Spondylolisthesis, Spinal stenosis, Laminectomy, Discectomy, Fixation, Herniated Disc.

ABSTRACT:

Introduction: Spondylosis is an age-related degenerative condition caused by normal wear and tear of spinal bones and soft tissues. Spondylolisthesis involves the forward slipping of one vertebra over another, resulting in mechanical pain or radicular symptoms. Spinal stenosis occurs due to narrowing of the spinal canal, leading to compression of neural structures and functional impairment. Conservative treatment includes NSAIDs and inflammation control and muscle relaxants to relieve spasms. Surgical options include laminectomy, discectomy, and spinal fusion.

Objectives: The aim of this study was to observe risk factors for spinal conditions, evaluate the effectiveness of treatment approaches, and determine the success rate of conservative and surgical interventions.

Methods: An observational cohort study was conducted on 120 patients aged 18–80 years with confirmed cervical or lumbar pathology. Data analysis was performed using MS Excel, Google Sheets, and unpaired t-test.

Results: This study found a 13.2% higher prevalence in males, indicating greater disease severity compared to females. Individuals aged 31–60 years, particularly 30–50 years, showed higher susceptibility to spinal degenerative conditions. Farmers and housewives were at increased risk due to physically demanding activities. Conservative treatment was successful in 66.7% of cases, while surgical management achieved an 88.3% success rate, with 11.7% requiring re-surgery due to complications.

Conclusions: The study concluded that only a few patients showed satisfactory relief with conservative treatment, whereas surgical interventions demonstrated higher effectiveness and better success rates.

1. Introduction

CERVICAL SPINE: The cervical spine is located in the neck region and consists of seven vertebrae labelled C1 to C7. It is a well-designed structure that provides support, flexibility, and stability to the head. The neck is made up of muscles, ligaments, tendons, nerves, and bones working together [1].

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LUMBAR SPINE: The lower back, or lumbar spine, is composed of five bigger vertebrae (L1–L5) than the others [2, 3].

COMMON CONDITIONS IN CERVICAL AND LUMBAR SPINE:

SPONDYLOSIS: Spondylosis is also known as osteoarthritis of the spine and commonly develops with aging due to normal wear and tear of the spinal bones and soft tissues [4]. It most frequently affects the cervical (neck) and lumbar (lower back) regions, which experience greater movement and stress [1].

SYMPTOMS OF CERVICAL SPONDYLOSIS: Neck pain and stiffness are the most common symptoms of cervical spine disorders. When spondylolytic changes compress nearby nerves, patients may experience pain, numbness, or tingling radiating down the arm [6]. This nerve compression caused by irritation or pressure on cervical nerve roots is known as cervical radiculopathy [5]. In severe cases, compression of the spinal cord can occur, leading to impaired motor function of the arms or hands, a condition called cervical myelopathy [6].

LUMBAR SPONDYLOSIS: The most common symptoms include lower back pain, leg pain, and other signs of nerve compression. Pain, numbness, or tingling that radiates to the hip or down the leg occurs due to nerve compression, a condition known as lumbar radiculopathy [2].

SPONDYLOLISTHESIS: Spondylolisthesis is defined as the slipping of one vertebral body relative to the next vertebral body, resulting in mechanical or radicular symptoms or pain. It might be congenital, acquired, or idiopathic in origin [1].

SYMPTOMS: Pain in the lower back, hips, and back of the thighs and Lower back pain that worsens with movement, standing, twisting, or bending. Pain relief with rest or lying down. In severe cases, numbness and tingling in the legs. Radiating leg pain due to nerve compression (pinched nerve) [7].

SPINAL STENOSIS: Spinal stenosis is a condition characterized by narrowing of the spinal canal, which compresses the spinal cord or nerve roots. It commonly causes pain, numbness, weakness, and difficulty in walking or maintaining balance [4].

SYMPTOMS: Neck pain or stiffness**,** Numbness, tingling, or weakness in the arms, hands, legs, or feet**.** "Pins and needles" sensation in the extremities**.** Difficulty walking or maintaining balance**.** Shooting pain radiating down the arms or legs**.** Neurological symptoms depending on the severity of nerve root or spinal cord compression [7, 3].

CAUSES AND RISK FACTORS:

Aging: Most common cause; degenerative changes increase after 40 years [3].

Abnormal spinal movement: Overuse during sports or heavy activities causing stress and injury [8].

Genetics: Weak bones and ligaments increase susceptibility [9].

Lifestyle factors: Smoking reduces disc hydration and shock absorption [7].

Obesity: Excess body weight increases stress on lumbar joints, accelerating degeneration [10].

SURGICAL INTERVENTIONS:

Laminectomy:
Laminectomy is usually recommended when conservative treatments such as medications, physiotherapy, or injections fail to provide relief, or when symptoms progressively worsen. It involves removal of the lamina to relieve pressure on the spinal cord or nerves, most commonly caused by bony overgrowths known as bone spurs [8, 11].

Discectomy:
Discectomy is one of the most common spinal surgeries performed to treat disc herniation and posterolateral spondylosis. The procedure aims to reduce nerve root compression by removing part or

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JCHR (2026) 16(2), 2203-2211 | ISSN:2251-6727

most of the nucleus pulposus while preserving the annulus fibrosus. It can be performed using open or endoscopic techniques [1, 12].

Spinal Fixation (Spinal Fusion) :
Spinal fusion is used in various spinal disorders affecting multiple levels and involves permanent joining of two or more vertebrae using cages or fixation devices. Although effective in improving stability and correcting deformities, it is a lengthy procedure with higher risk of complications, particularly in elderly patients [3, 13].

2. Objectives

The aim of this study was to observe risk factors for spinal conditions, evaluate the effectiveness of treatment approaches, and determine the success rate of conservative and surgical interventions.

To find out what percentage of people undergoing laminectomy, discectomy and spinal fixation

To find out which gender and age group people are more prone to spinal conditions.

To assess the success rate of conservative treatment in managing cervical and lumbar spine conditions.

To assess the success rate of surgical procedures like laminectomy, discectomy, and spinal fixation.

To compare the success rate between patients who receive conservative treatments and those who undergo surgery.

3. Methods

Study Site: The study was conducted at Amrutha Hospital (Centre for Neuro and Trauma), Hanamkonda.

Study Period: The duration of the study was 6 months.

Study Design: This was a prospective observational cohort study.

Sample Size: A total of 120 patients were included in the study.

Participants: Patients diagnosed with cervical and lumbar spine disorders such as disc herniation and spinal stenosis, and who were eligible for either conservative management or surgical intervention.

Inclusion Criteria: Adults aged 18–80 years with confirmed cervical or lumbar pathology, including herniated disc, spinal stenosis, or degenerative disc disease, and candidates suitable for both conservative and surgical treatment.

Exclusion Criteria: Patients with non-degenerative spinal conditions such as tumours or infections, those with severe comorbidities contraindicating surgery (e.g. uncontrolled cardiovascular disease), and pregnant or breastfeeding women.

Statistical analysis: By using unpaired T-test statistical analysis the obtained p value of conservative treatment vs surgical interventions is less than 0.0001. By conventional criteria, the difference is considered to be extremely statistically significant.

4. Results

CONSERVATIVE MANAGEMENT DISTRIBUTION:

TABLE-1: AGE AND GENDER DISTRIBUTION

VARIABLE	CATEGORY	n	%
Gender	Female	36	60.00%
	Male	24	40.00%
Age group	<31	5	8.30%
	31-50	29	48.30%
	51-70	23	38.30%
	>70	3	5.00%

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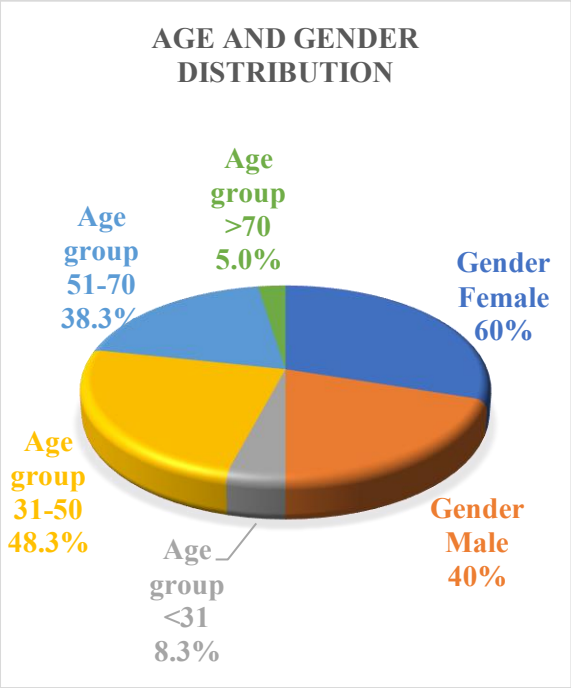

FIGURE-1: AGE AND GENDER DISTRIBUTION

The above figure depicts the participation of male and female research participants. There were 36 women and 24 males among the 60 patients. In general, women outnumbered men—60% of the population was female, 40% male. The bulk of patients (48%) were between the ages of 31 and 50, with 38% aged 51 to 70, 8.3% under 31 years, and 5% beyond 70 years.

TABLE-2: OCCUPATIN WISE DISTRIBUTION

S.NO	OCCUPATION	n	%
1.	Student	1	1.70%
2.	Driver	5	8.30%
3.	Farmer	18	30.00%
4.	Housewife	21	35.00%
5.	Labourer	4	6.60%
6.	Lecturer	1	1.70%
7.	Software	4	6.70%
8.	Nil	6	10.00%

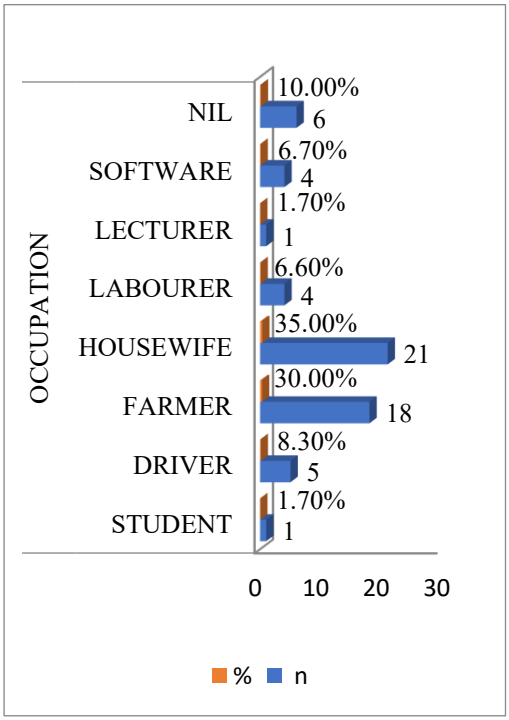

FIGURE-2: OCCUPATIN WISE DISTRIBUTION

This illustrates the main risk factor for degenerative spine disorders. Out of 60 patients, 35% are housewives, 30% are farmers, 8.3% are drivers, 6.7% are software workers, 6.6% are everyday laborers, 1% are students, and 10% are elderly patients without occupation.

TABLE-3: SOCIAL HISTORY AND SUCCESS RATE DISTRIBUTION

VARIABLE	TYPE	n	%
Social history	Smoking	7	11.70%
	Alcoholic	7	11.70%
	None	46	76.60%
Success rate	Succussed therapy	40	66.70%
	Unsuccessed therapy	20	33.30%

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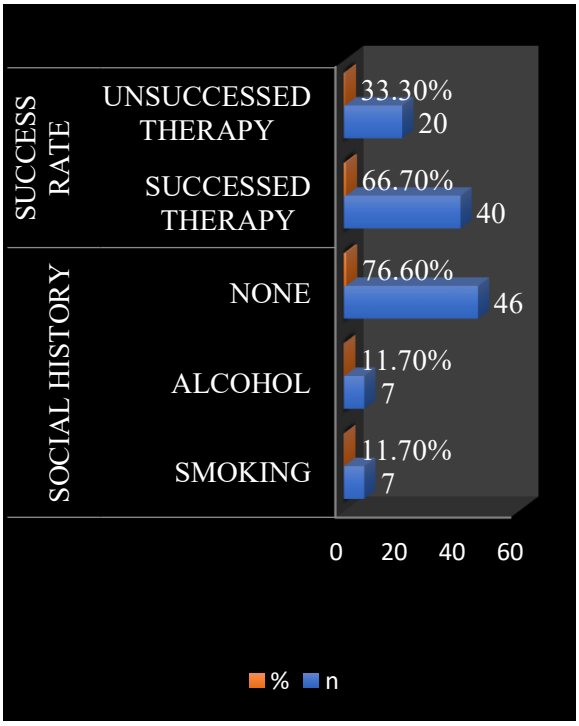

FIGURE-3: SOCIAL HISTORY AND SUCCESS RATE DISTRIBUTION

The social behaviors of patients who were part of the study are shown in the above graph. Seven (11.7%) of the patients in this study had a smoking habit, and seven (11.7%) had a drinking habit. There were 46 (76.6%) patients who had no social history. Overall, 66.7% of patients improved with conservative management, whereas 33.3% required surgical intervention due to worsening symptoms.

SURGICAL INTERVENTIONS:

TABLE-4: SURGICAL GENDER AND AGE WISE DISTRIBUTION:

VARIABLE	CATEGORY	n	%
GENDER	FEMALE	26	43.40%
	MALE	34	56.60%
AGE GROUP (Years)	<31	3	5.00%
	31-50	27	45.00%
	51-60	12	20.00%
	>60	18	30.00%

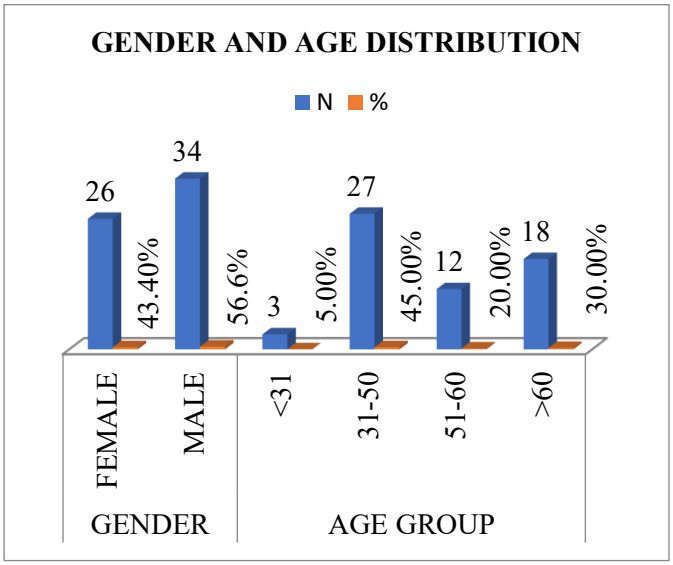

TABLE-4: SURGICAL GENDER AND AGE WISEDISTRIBUTION

The information regarding the participation of the study's male and female participants is shown in the above figure. Out of 60 patients, 56.6% of the men and 43.4% of the females had spinal operations. Most patients were aged 31–50 years (45%), followed by those above 60 years (30%), 51–60 years (20%), and below 31 years (5%).

TABLE-5: SURGICAL OCCUPATION WISE DISTRIBUTION

S.NO:	OCCUPATION	n	%
1.	Student	1	1.60%
2.	Software	1	1.60%
3.	Municipal worker	1	1.60%
4.	Labourer	6	10.00%
5.	Housewife	18	30.00%
6.	Farmer	19	31.00%
7.	Driver	7	11.70%
8.	Aged	7	11.70%

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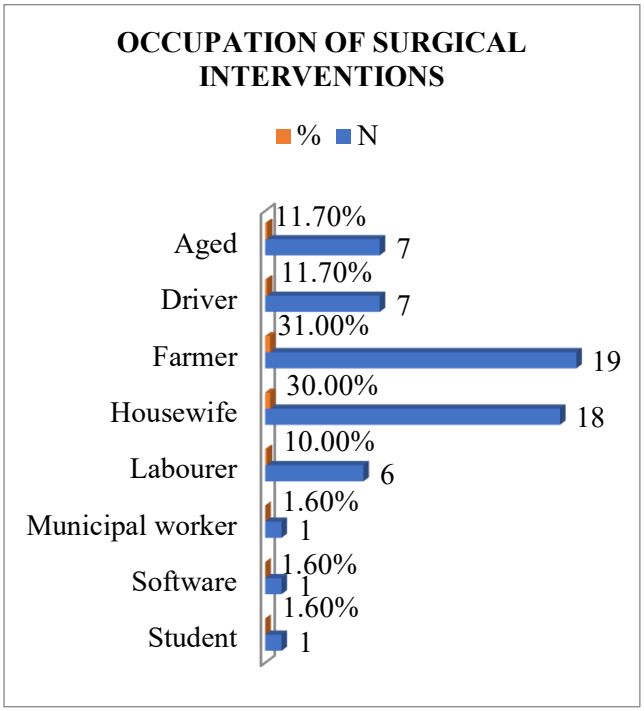

FIGURE-5: SURGICAL OCCUPATION WISE DISTRIBUTION

One of the main risk factors for degenerative spine disorders is the patients' occupation, which is depicted in the above image. Out of the 60 patients, 19 (31.7%) were farmers, 18 (30%) were housewives, 7 (11.7%) were drivers, 7 (11.7%) were elderly patients without a job, 6 (10%) were laborers, 1 (1.6%) was a student, 1 (1.6%) was a software developer, and 1 (1.6%) was a municipal employee.

TABLE-6: SURGICAL SOCIAL HISTORY DISTRIBUTION

SOCIAL HISTORY	N	%
Smoking	7	11.60%
Alcohol	1	1.60%
Both	12	20.20%
None	40	66.60%

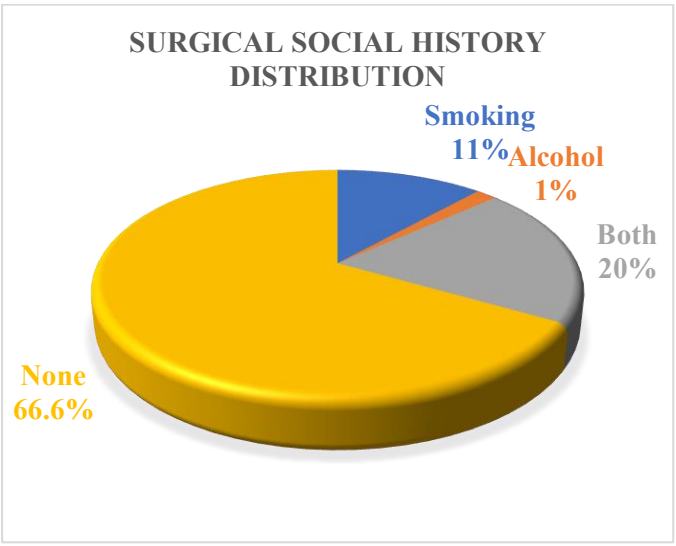

FIGURE-6: SURGICAL SOCIAL HISTORY DISTRIBUTION

The social habits of the surgery patients who were part of the study are shown in the graph above. Seven patients (11.6%) had a habit of smoking, one patient (1.6%) had a habit of drinking alcohol, and twelve patients (20.2%) had both social habits. Forty patients (66.6%) had no social history.

TABLE-7: TYPE AND LEVEL OF SURGERY UNDRWENT

VARIABLE	CATEGORY	n	%
TYPE OF SURGERY	LAMINECTOMY, FUSION	2	3.30%
	LAMINECTOMY, DISCECTOMY	4	6.70%
	LAMINECTOMY	10	16.70%
	FUSION	3	5.00%
	DISCECTOMY, FUSION	5	8.30%
	DISCECTOMY	36	60.00%
LEVEL OF PROCEDURE UNDERWENT	CERVICAL	10	16.70%
	LUMBAR	34	56.60%
	LUMBOSACRAL	16	26.70%

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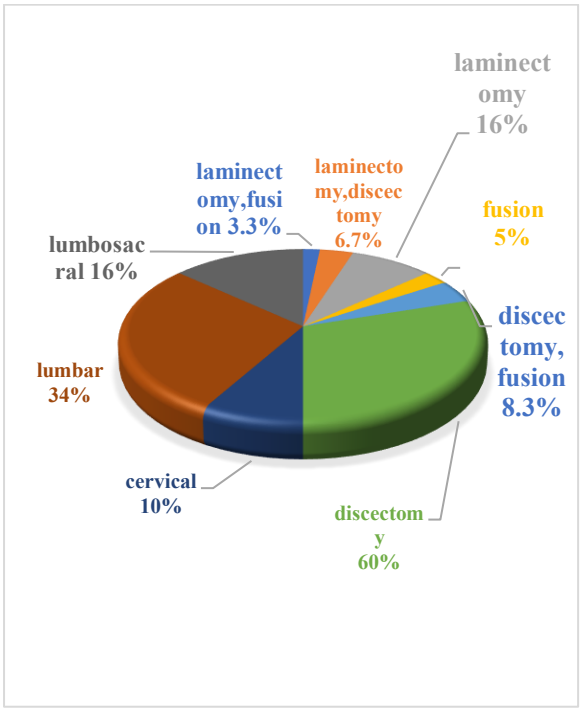

FIGURE-7: TYPE AND LEVEL OF SURGERY UNDRWENT

Out of 60 patients, 36 (60%) underwent discectomy, 10 (16.7%) underwent laminectomy, 5 (8.3%) underwent discectomy + fusion, 4 (6.7%) underwent laminectomy + discectomy, 3 (5%) underwent fusion, and 2 (3.3%) underwent both procedures. This shows that a greater number of persons are affected by spinal disc degeneration. As a result, the majority of patients (60%) received discectomy. This graph indicates that the majority of surgical procedures were performed in the lumbar region (55%), followed by the lumbosacral (26.7%) and cervical (16.7%) regions.

TABLE-7: SUCCESS RATE IN SURGICAL INTERVENTIONS

SUCCESS RATE	n	%
Succussed therapy	53	88.30%
Un-succussed therapy	7	11.70%

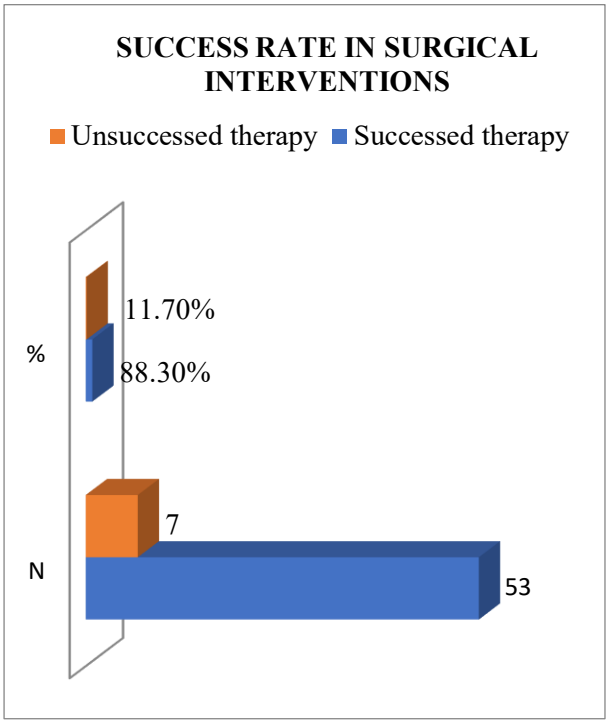

FIGURE-7: SUCCESS RATE IN SURGICAL INTERVENTIONS

The graph above represents the success rate of surgical treatments performed on patients included in this study. Out of 60 patients, 53 (88.3%) were successful with better outcomes following surgery, while 7 (11.7%) were unsuccessful and required re-surgery due to various reasons such as instability and fluid leakage.

5. Discussion

The present study was conducted at Amrutha Hospital, Centre for Neuro and Trauma, Hanmakonda, as a prospective observational study titled "Effectiveness of Conservative Treatment versus Surgical Interventions in Cervical and Lumbar Spine Conditions." The study aimed to evaluate and compare the effectiveness of conservative management and surgical interventions in patients with cervical and lumbar spine disorders. The findings contribute to the growing body of literature by providing insights into patient outcomes, symptom relief, and functional improvement.

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A study published in 2021, titled "Prevalence of Spine Degeneration Diagnosis by Type, Age, Gender, and Obesity Using Medicare data" reported a higher prevalence of degenerative spine conditions among females compared to males [14]. In contrast, the present study showed that in the conservative treatment group, females accounted for 60% and males 40% of the patients. However, in the surgical intervention group, 56.6% were males and 43.4% were females, indicating a male predominance in patients undergoing surgery. Overall, males exceeded females by 13.2%, suggesting that disease severity may be greater among males.

A study published in 2021, which reported that spinal degeneration becomes evident after the age of 40 and increases with advancing age [15]. In the conservative treatment group, 48% of patients were aged 31–50 years, 38% were aged 51–70 years, 8.3% were below 31 years, and 5% were above 70 years. In the surgical group, 45% were aged 31–50 years, 30% were above 60 years, 20% were aged 51–60 years, and 5% were below 31 years. These findings indicate that individuals aged 31–60 years are more prone to spinal degenerative conditions, with greater severity observed between 30–50 years.

Occupational distribution was compared with findings from a study published in 2002 showing There was moderate evidence suggesting a modest association between occupational loading and disc degeneration [16]. In our conservative group, housewives (35%) and farmers (30%) were most affected, followed by drivers, software workers, daily labourers, students, and elderly individuals without occupation. In the surgical group, farmers (31.7%) and housewives (30%) predominated, followed by drivers, labourers and others, indicating higher risk among physically demanding occupations.

A study published on 2017 showed surgical treatment superior outcomes [17]. In our study, in surgical details, most procedures were performed in the lumbar region (55%), followed by the lumbosacral (26.7%) and cervical (16.7%) regions. Discectomy (60%) was the most common procedure, indicating a predominance of disc-related pathology. In the conservative group, 66.7% of patients improved, while 33.3% required surgery due to symptom severity. In the surgical group, 88.3% achieved successful outcomes, whereas 11.7% required re-surgery due to complications such as instability, fluid leakage, or recurrent herniation.

By using unpaired T-test statistical analysis the obtained p value of conservative treatment vs surgical interventions is less than 0.0001. By conventional criteria, the difference is considered to be extremely statistically significant.

This study explains that only a few patients experienced better relief with conservative treatment, and it may not provide sufficient relief in severe cases. Patients with mild to moderate conditions (e.g., disc herniation, degenerative disc disease, and mild stenosis) often benefit significantly from conservative treatment and show gradual improvement.
In contrast, surgery tends to provide better effectiveness for patients with severe nerve compression, progressive neurological deficits, and structural instability. Surgical intervention generally offers faster and more significant pain relief, particularly in patients with radiculopathy, myelopathy, or severe spinal stenosis. However, some patients who undergo surgery may still require postoperative rehabilitation and conservative management. Overall, this study demonstrates that surgical interventions have greater effectiveness and a higher success rate compared to conservative treatment.

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